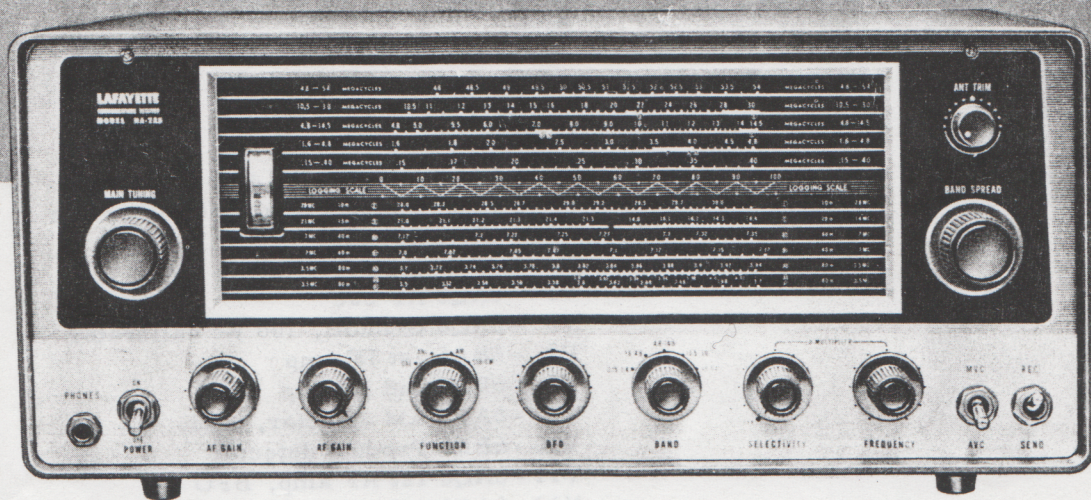


LAFAYETTE

MODEL HA-225

Stock No. 99-2523WX



COMMUNICATIONS RECEIVER

OPERATING MANUAL

TECHNICAL SPECIFICATIONS

FREQUENCY COVERAGE	Band 1: 150 - 400 Kc Band 2: 1.6 - 4.8 Mc Band 3: 4.8 - 14.5 Mc Band 4: 10.5 - 30 Mc Band 5: 48 - 54 Mc
BANDSPREAD (ham band directly read)	80 meter band 40 meter band 20 meter band 15 meter band 10 meter band
OPERATION	AM, SSB, and CW AM diode detector SSB/CW product detector
POWER SOURCE	117 volts 50/60 cycles AC
POWER CONSUMPTION	60 VA
AUDIO OUTPUT	1.5 watt, 8 or 500 ohms impedance
AUXILIARY CIRCUITS	Electrical bandspread Q-Multiplier ANL AVC-MVC BFO 100 Kc crystal calibrator
TUBE COMPLEMENT	V1 - 6AQ8 6 meter RF amp V2 - 6BL8 6 meter mixer, 6 meter osc V3 - 6BA6 RF amp V4 - 6BE6 mixer V5 - 6AQ8 HF osc V6 - 6AQ8 Q-multi, 100 Kc calibrator V7 - 6BA6 1st IF amp V8 - 6BA6 2nd IF amp V9 - 6AL5 AM detector, ANL V10 - 6BE6 Product detector V11 - 6AQ8 1st AF amp, BFO V12 - 6AQ5 AF output V13 - 0A2 Voltage regulator V14 - 6CA4 Full-wave rectifier
DIMENSIONS	17" wide, 7-1/2" high, 10" deep
NET WEIGHT	23 lbs.

INSTALLATION

POWER SOURCE

The receiver is designed to operate from a 117 volt, 50-60 cycle AC power source. DO NOT OPERATE FROM A DC SOURCE.

SPEAKER CONNECTION

A three-terminal strip marked SPEAKER is provided at the rear of the receiver for speaker connections. In the case of a PM speaker with either 4 or 8 ohm impedance, simply connect one lead to the ground terminal "O" and the other lead to the terminal designated 8 Ω . The output power of the receiver is sufficient to drive a 4 - 12 inch speaker adequately.

HEADPHONES

A standard phone jack is provided on the front panel of the receiver for headphone reception. Headphones of low impedance (approx. 10 ohms) are recommended for optimum results. In addition, a high impedance headphone (without plug) may be connected between the 0 and 500 Ω terminals at the rear.

ANTENNAS

6-METER ANTENNA

A coaxial connector at the rear of the receiver marked "6M ANT" is provided for connection of your 6 meter antenna. Use RG8/U or RG58/U coaxial cable (52 ohms) terminated with PL-259-type male connector. When using RG58/U cable and PL-259 connector, a reducer (type UG175/U) is necessary.

MAIN ANTENNA

The A and E terminals or coaxial connector (MAIN ANT) are provided for connection of your main antenna (for reception on all bands except 6 meters). A and E terminals may be used for either of the two following types of connections.

INVERTED L ANTENNA

The inverted L type of antenna will provide satisfactory performance over the entire tuning range (except 6 meters). Simply connect one end of the antenna lead-in wire to "A". For good reception, the antenna wire should be placed as high as possible and 50-100 feet long (see Fig. 1). In some instances, a wire connected from terminal "E" to a water pipe may improve reception.

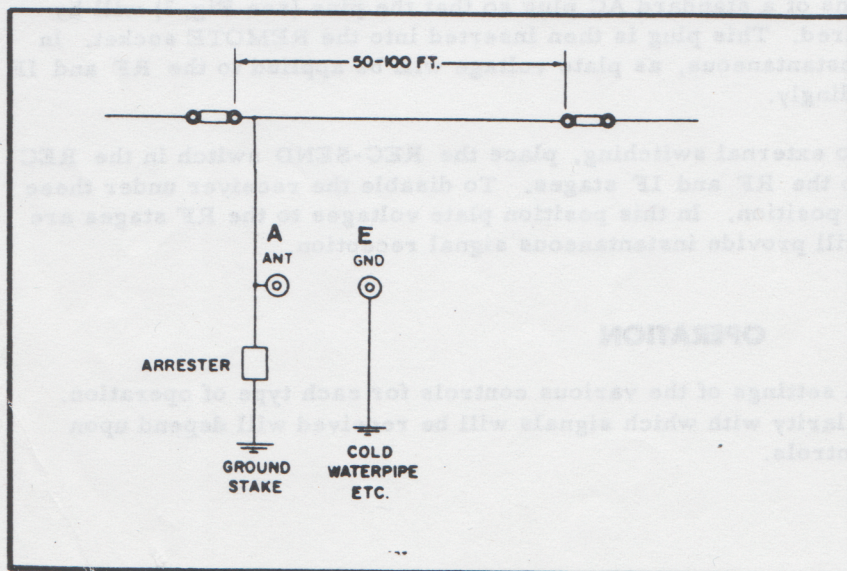


FIGURE 1

INVERTED "L" ANTENNA

DOUBLET ANTENNA

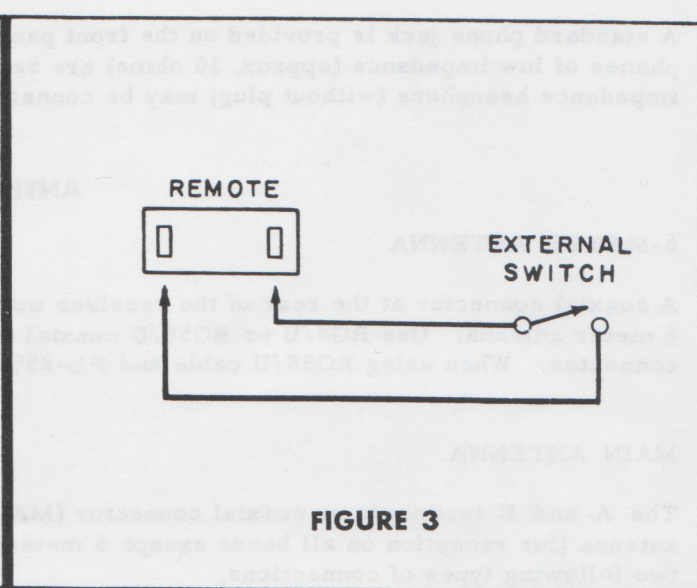
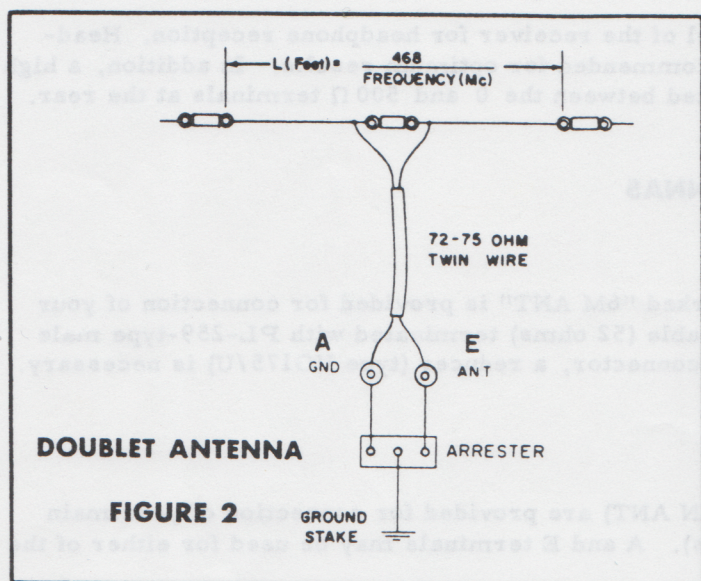
A doublet antenna will give excellent results, especially on amateur bands. A 75 ohms balanced transmission line should be used (as shown in Fig. 2). Since the doublet antenna provides optimum performance only at a given frequency, it should be cut to the length for the most often used band of frequencies. The overall length of a doublet antenna can be determined by using the following formula:

$$L \text{ (Length in feet)} = \frac{468}{\text{Frequency in megacycles}}$$

Since the doublet antenna displays directional properties broadside to its length, it should be oriented in such a manner that maximum signal pickup can be realized.

When using either a balanced transmission line or a twisted pair, the leads connect to terminals "A" and "E" respectively. A height of 30-50 feet is recommended for good reception of weak signals.

NOTE: A lightning arrester should be included in any outdoor installation.



REMOTE SOCKET

A socket in the back of the receiver (REMOTE) allows simultaneous control of this receiver with a transmitter. An external switching device can be constructed so that the receiver will be inoperative during periods of transmission. In this case, the REC-SEND switch is placed in the SEND position. The external switch is attached by means of a standard AC plug so that the pins (see Fig. 3) will be connected when signal reception is desired. This plug is then inserted into the REMOTE socket. In this manner, signal reception will be instantaneous, as plate voltage will be applied to the RF and IF stages when the switch is closed accordingly.

For normal operating conditions with no external switching, place the REC-SEND switch in the REC position, thus providing plate voltage to the RF and IF stages. To disable the receiver under these conditions, set the switch to the SEND position. In this position plate voltages to the RF stages are cut off. Returning the switch to REC will provide instantaneous signal reception.

OPERATION

The following chart indicates the initial settings of the various controls for each type of operation. Thereafter, the degree of strength or clarity with which signals will be received will depend upon proper re-adjustment of the various controls.

INITIAL CONTROL SETTINGS

CONTROL	AM OPERATION	CW OPERATION	SSB OPERATION
RF GAIN	Max	Adjust for desired audio output level	Adjust for desired audio output level
FUNCTION	AM	SSB-CW	SSB-CW
BFO	Inoperative	Mid-position (dot)	Mid-position (dot)
BAND	Set to proper range	Set to proper range	Set to proper range
SELECTIVITY	OFF*	OFF*	OFF
FREQUENCY	Inoperative**	Inoperative**	Inoperative
MVC-AVC	AVC	MVC	MVC
ANT TRIM	12 o'clock	12 o'clock	12 o'clock
BANDSPREAD	Set to 100 on Logging scale	Set to 100 on Logging scale	Set to 100 on Logging scale
AF GAIN	Adjust for desired audio output level	2/3 to 3/4 clockwise	2/3 to 3/4 clockwise

* Q-Multiplier operation -- may be used to increase selectivity if interference from adjacent signals is present.

** Operative only when SELECTIVITY control is switched on.

MAIN TUNING

The main tuning and bandspread dials are calibrated in megacycles and contain special markings to simplify tuning. The major amateur radio bands are contained in the 3.5 to 4.0, 7.0 to 7.3, 14.0 to 14.35, 21.0 to 21.45, 28.0 to 29.7 and 50.0 to 54 megacycle bands. The location of each amateur band is indicated by heavy white scale lines on the main tuning dial (except on the 48.0 to 54.0 Mc scale). The circled letter or letters which appear with each band indicate the bandspread scale to be used. Calibration of the main tuning scales is correct when the bandspread pointer is set at 100 on the LOGGING SCALE.

BANDSPREAD OPERATION

Bandspreading on the amateur bands is carried out in the following manner: Set the bandspread pointer initially to 100 and the main tuning pointer directly over the circled letter for the band to be tuned. In some cases the band is split between two such letters. For example, B1 and B2 together cover the range of 7.0 to 7.35 megacycles -- B1 from 7.0 to 7.17, B2 from 7.17 to 7.35 megacycles.

The calibrated bandspread scale which is used is indicated to the right and left-hand side. Thus, if the main tuning pointer is set directly over B1, the bandspread scale in use is the one marked B1, the fourth one down. Tuning is then accomplished solely with the BANDSPREAD control.

Short-wave bandspreading, for other than amateur bands, is accomplished by setting the bandspread pointer at 100 on the Logging Scale and the main tuning pointer at the high end of the portion of the short-wave band which contains the station to be tuned. Rotate the bandspread control to tune over this portion. Moving the bandspread pointer towards O on the logging scale subtracts from the frequency indicated on the main tuning scale. Logging of short-wave stations is possible by noting the readings on both the Main Tuning and Logging Scales.

THE Q-MULTIPLIER CIRCUIT

The Q-Multiplier provides the additional selectivity often required for optimum reception of signals in the congested short-wave bands. It may be employed during phone (AM) or CW reception whenever conditions require the use of additional selectivity. A little experience in using the Q-Multiplier will be necessary for optimum results under different receiving conditions. In the hands of an experienced operator, the Q-Multiplier is a very useful tool, and will greatly enhance the performance of the receiver.

The controls associated with the Q-Multiplier circuit are the SELECTIVITY and FREQUENCY controls. The circuit is not operative when the Selectivity control is in the "off" position.

Selectivity Control

When the SELECTIVITY control is in the OFF position, the Q-Multiplier circuit is disconnected, providing the receiver's normal IF band pass during reception. Beyond the OFF position, the circuit is connected to the 1st IF stage and now introduces a narrow "gate" through which the IF signals must pass. The width of this gate is determined by the position of the SELECTIVITY control. Advancing the control clockwise serves to peak the signal increasingly until a point of oscillation is reached. Sharpest selectivity is reached just prior to oscillation.

NOTE: When the Q-Multiplier is initially switched into the IF circuit, there will be a slight reduction in gain which must be overcome by increasing the AF or RF gain control.

Frequency Control

This control is used in conjunction with the SELECTIVITY control. When the Selectivity control is used to increase selectivity during Q-Multiplier operation, the sharp peak produced can be moved around within the IF pass band by means of the FREQUENCY CONTROL to reduce or eliminate interference from adjacent signals.

S-METER READINGS

The S-Meter provides a means of measuring the relative strength of incoming signals. Relative readings are only correct when the RF GAIN control is fully clockwise. Measurements are read in S units from 1 to 9 and in decibels above S9 from 0 to 40 db. The circuit is disabled when the MVC/AVC switch is in the MVC position.

A ZERO ADJ control at the rear of the receiver is provided for zeroing the S-Meter electrically. The zero adjustment is made with the antenna disconnected, RF GAIN control at maximum and AVC on.

ANTENNA TRIMMER

The ANT TRIM control, adjustable from the front panel, acts as a compensating capacitor to permit optimum matching of the receiver to the antenna at all frequencies. The control should always be adjusted for maximum background noise or signal. Each setting will be good only over a limited range of frequencies. The trimmer should therefore always be readjusted after tuning to the general area where the expected signal is to be found.

AM OPERATION

For AM reception place all controls in the positions indicated in the Initial Control Settings chart. Tune in station, using Main and Bandsread tuning controls as indicated in the section under "TUNING".

Adjust ANT TRIM for highest "S" meter reading on signal. If excessive spurious noises such as those caused by auto ignition make reception difficult, place the FUNCTION switch in the ANL (Automatic Noise Limiter) position. The automatic noise limiter should be used only when necessary, since it tends to reduce the overall efficiency of the receiver.

If interference from nearby stations makes reception difficult, the Q-Multiplier may be employed to minimize or eliminate the interference.

THE CONTROLS AND THEIR FUNCTIONS

MAIN TUNING

Tunes Frequency Range Of Receiver As Determined By Band Selector Setting

S-METER

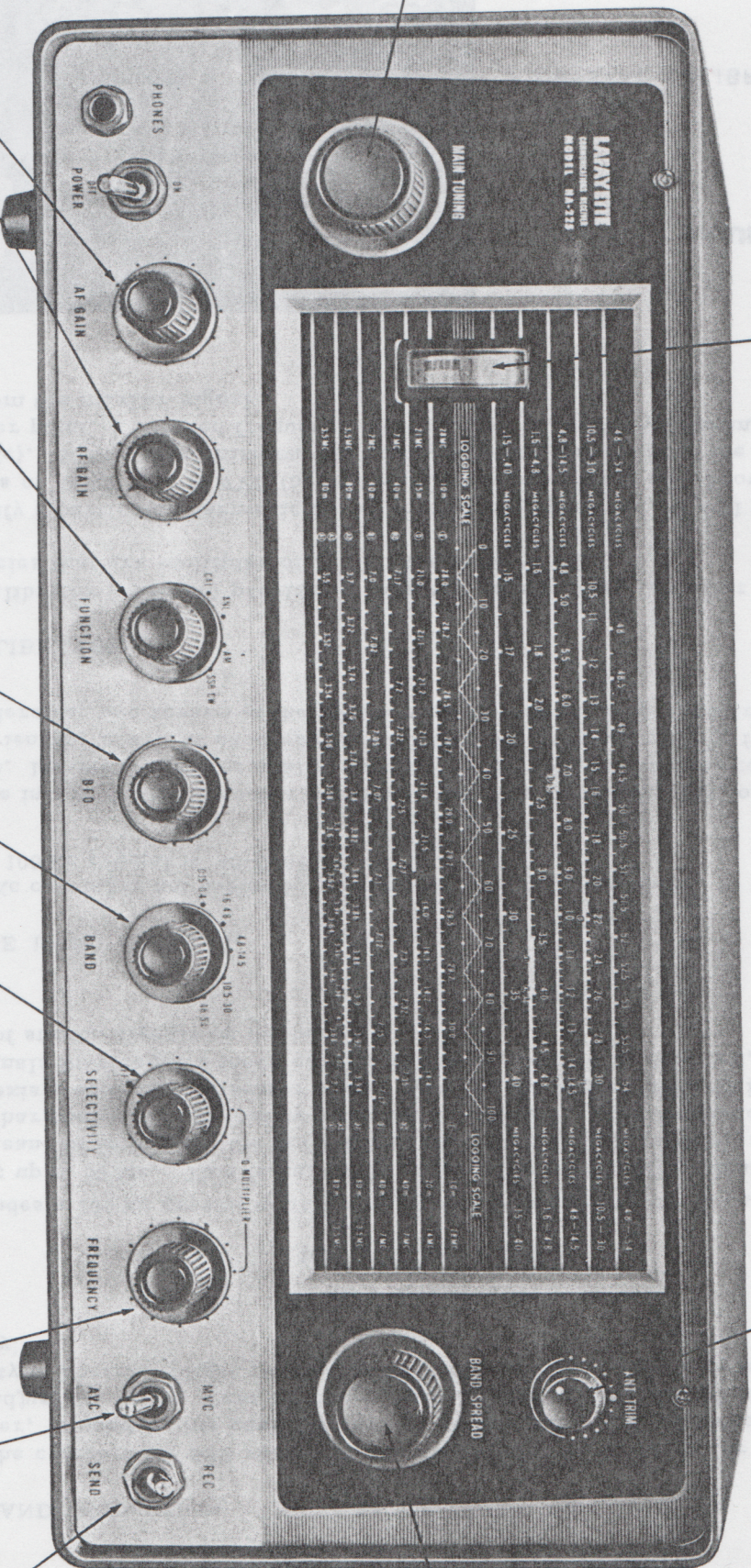
Acts As A Tuning Indicator - Shows Relative Signal Strength

ANT TRIM

Adjusts Receiver For Best Antenna Match Over Entire Frequency Range

BANDSPREAD

Permits Expanded Tuning Of Small Portions Of The Main Tuning Dial



AF GAIN

Adjusts Audio Output Level

FUNCTION

Selects Mode of Operation

BFO

Used to Vary Pitch for CW or provide clarity for SSB

SELECTIVITY

Switches in Q-Multiplier; permits progressive reduction in bandwidth for increased selectivity.

FREQUENCY

Used during Q-Multiplier operation to eliminate interference from adjacent signals.

RECEIVE-SEND SWITCH

RF GAIN

Adjusts RF Gain - Used As Volume Control for CW-SSB

BAND SELECTOR SWITCH

Selects one of five frequency bands

MVC-AVC

AVC Position Used to Minimize Fading Of Signals

CW OPERATION

The control settings required for the reception of code signals are indicated in the chart. AVC is switched off and the RF GAIN control is used as a volume control. Tune signal to zero beat. The BFO control should then be adjusted on either side of dot (mid-position) for desired pitch. If necessary, the Q-Multiplier may be used to increase selectivity.

SINGLE SIDE BAND OPERATION

The settings of the controls for SSB reception are essentially the same as for CW (see chart). The BFO frequency however, is used in this case for carrier reinsertion. AVC is switched off and the RF GAIN control used to adjust the level. Tune station in with BANDSPREAD control and then adjust the BFO control for clarity of speech. Slight readjustment of the BANDSPREAD may be necessary to provide best audio quality.

100 KC CALIBRATOR

The HA-225 includes a 100 Kc crystal calibrator circuit which will provide accurate marker signals every 100Kc up to 30 Mc. This feature will be useful in determining amateur band edges and will also provide a means of improving the accuracy of the receiver dial settings. It should be noted, however, that these harmonics will gradually diminish in strength as the frequency is increased. This is a condition that exists with any calibrator of this type. In the higher frequencies therefore (5-30 Mc), the harmonic signals may require more careful tuning in order to be detected, particularly if there are a great number of station signals on the band.

INSTALLING THE 100KC CRYSTAL

NOTE: The 100 Kc crystal is not normally supplied with the receiver unless so ordered (Lafayette Stock No. for the 100 Kc crystal is 40-0901L).

The crystal can be inserted into its socket from the rear of the receiver. The location of the socket is shown in Figure 4. Insertion of the crystal can usually be carried out with the cover on. However, if difficulty is experienced, it will be necessary to withdraw the receiver chassis from the cabinet (six screws on the underside, two screws at the upper front) in order to insert the crystal.

USING THE CALIBRATOR

Basically, the calibrator (when on) provides a means of determining the exact receiver dial settings at which frequencies that are multiples of 100 Kc are to be found.

In order to identify a particular harmonic in the short-wave spectrum, it will be necessary to employ the transmissions of WWV and WWVH (or other station transmitting on a known frequency which is a multiple of 100 Kc). Such a transmission will coincide with a harmonic of the calibrator. Starting at this known marker point, a desired frequency setting may be found by counting the number of calibrator harmonics from the marker signal.

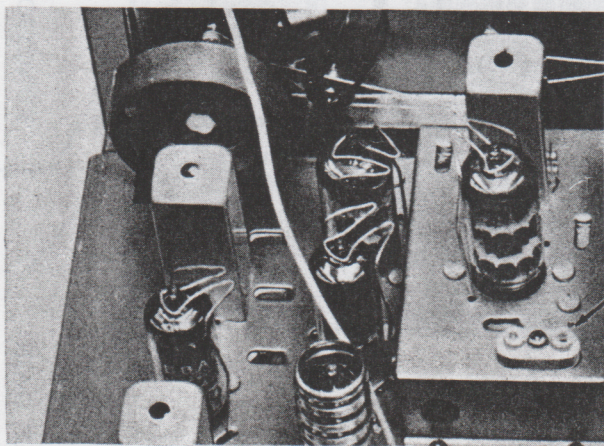


FIGURE 4

100 KC
CRYSTAL CALIBRATOR

CIRCUIT DESCRIPTION

6 METER PRE-CONVERTER

The 6 meter pre-converter section consists of V1, a dual triode acting as a cascode RF amplifier, and V2, a triode-pentode, the triode section being employed as a crystal oscillator and the pentode section as the mixer. This type of RF amplifier ensures low noise, coupled with broadband characteristics and is extremely stable in operation.

The crystal oscillator operates at a fixed frequency of 43 Mc. Thus, incoming RF signals in the 48-54 Mc range are converted to a lower frequency of 5-11 Mc, the tuned circuit in the plate of the Mixer being broadly tuned to this range of frequencies.

For reception on 6 meters, use is made of the 4.8-14.5 Mc tuned circuits in the receiver. Although the Antenna circuit is unchanged, capacity is added to the RF and oscillator tuned circuits, as explained later.

The output of the pre-converter is fed to the antenna tuned circuit of the 4.8-14.5 Mc band and receives normal RF amplification through V3.

If no changes were made to the RF and oscillator tuned circuits, the converted signals (now 5-11 Mc) would be passed through the receiver in the normal way and be tuned between 5 and 11 Mc on the 4.8-14.5 Mc band. However, 5-11 Mc occupies only a portion of this scale. In order to provide tuning over a greater area and thus permit the use of a separate calibrated scale, certain changes are made to the RF and oscillator tuned circuits which alter the tuning characteristics. In the 48-54 Mc position of the BAND switch, additional capacity is introduced across the RF (C100, CM-5) and oscillator (C101, CO-6) tuned circuits of the 4.8-14.5 Mc band. This alters the L-C ratio of the tuned circuits, producing an expanded range of tuning for what is essentially the 5-11 Mc band. A special scale, calibrated from 48-54Mc, is then provided for tuning over 6 meter band.

ANTENNA STAGE (All bands except 6 meters)

The RF amplifier (V3) provides the necessary gain and preselection required for high sensitivity and rejection of image frequencies. Individual antenna input coils are used with an unbalanced input. A variable resistor in the cathode of V3 varies the gain of the tube and thus acts as an RF gain control.

The ANT TRIM control, adjustable from the front panel, acts as a compensating capacitor to permit optimum tuning of the input circuits to the received frequency.

MIXER STAGE

The use of a separate high-frequency oscillator, V5, results in a more stable receiver, particularly at the higher frequencies. The output signal from V3 is electronically mixed with the output of V5 in the mixer tube V4. V5 provides a signal 455 Kc higher than the incoming signal on all frequency ranges.

Because voltage is applied to the filaments of V4 and V5 at all times (even with receiver switched off), little or no frequency drift is experienced at any time during the operation of this receiver -- a high degree of stability is assured from the moment the unit is switched on.

Q-MULTIPLIER STAGE

V6a (and its associated circuitry) serves to provide Q-Multiplier operation, when needed. A switch on the SELECTIVITY control, when on, connects the circuit through C21 to the output of the Mixer, V4, and also applies B+ to V6a, the Q-Multiplier tube. The circuit operates as a positive feedback device having a highly selective tuned circuit which can be made to produce a peak in the IF passband. In effect then, the circuit acts as a "gate" through which all IF frequencies are passed. The sharpness of the peak is adjusted by means of the SELECTIVITY control which varies the gain of V6a. The resultant peak can also be moved around in the IF passband by adjustment of the FREQUENCY control. The selectivity of the IF thus becomes adjustable and, in addition, the portion of the signal which contains the least amount of adjacent signal interference can be selected.

AM DETECTION, AVC and ANL

V9a, one half of double-diode 6AL5, serves as an AM diode detector and AVC rectifier. The rectified signal at the plate of V9a is applied as a negative bias voltage (AVC) to the grids of V8, V7 and V3 to keep the receiver output level constant regardless of input signal variations. In the MVC position of the MVC-AVC switch, the AVC line is grounded and AVC is not in operation. V9b, the second diode, acts as an Automatic Noise Limiter by cutting noise peaks (caused by auto ignition, etc.) during reception. The ANL circuit is in operation only when the FUNCTION switch is in the ANL position. In either case, the detected AM signal is fed through one section of the FUNCTION switch to the first audio amplifier, V11a. A variable control (AF GAIN) provides adjustment of the audio level.

DETECTION FOR CW and SSB

For CW or SSB reception, V10 acts as a product detector. During CW reception the BFO signal is mixed with the incoming IF signal in V10 to produce an audio "beat note" in the output. The control designated "BFO" varies the frequency of the BFO and thus permits adjustment of the pitch of the audio tone. For SSB reception, the incoming IF is mixed in V10 with the BFO signal which, in this case, serves to reinsert the carrier (single-sideband signals are transmitted with the carrier suppressed). Proper adjustment of the BFO control will produce a properly demodulated SSB signal at the output of V10.

1ST AUDIO AMPLIFIER

V11a serves as the first audio amplifier, the variable resistor in the grid circuit acting as the AF GAIN control.

AUDIO OUTPUT

V12 is employed as a conventional resistance-coupled amplifier. T4, the output transformer, provides impedance connections of 8 and 500 ohms. A standard headphone jack is also connected to the 8 ohm tap. An RCA-type phono jack connected in the grid circuit of V12 provides an output for recording purposes or for connecting to an external amplifier.

POWER SUPPLY

V14 functions as a full-wave rectifier in a conventional power supply circuit. The primary of the AC power transformer is fused for safety (2 amp).

A separate 6 volt filament transformer is employed for V4 (mixer) and V5 (oscillator). The AC power to the primary of this transformer is not switched and thus continuously supplies filament voltage to V4 and V5 even with the receiver switched off, maintaining these tubes at a proper operating temperature. This arrangement ensures stable, drift-free operation as soon as the receiver is turned on. The current drawn by these tubes is negligible.

V13, a voltage regulator tube, provides good regulation of the BFO (V11b) and high frequency oscillator (V5) voltages and thus ensures better stability of the receiver during operation.

ALIGNMENT INSTRUCTIONS

The receiver has been fully aligned at the factory before shipment to you and does not normally require further adjustment. When necessary, however, the receiver may be aligned as indicated.

CHASSIS REMOVAL

To withdraw the chassis from the cabinet, remove six screws on the underside, two screws on the upper front, and slide the chassis out from the front of the cabinet.

EQUIPMENT REQUIRED: AC Voltmeter, Calibrated RF Signal Generator, Alignment Tools, GC8282 (IF) and GC8276 (RF).

IF ALIGNMENT

1. Connect a loudspeaker and AC voltmeter across the output terminals on the receiver.
2. Remove the high frequency oscillator V5 (6AQ8) from its socket and then set all controls as follows:
 - REC-SEND switch to REC
 - BAND to 0.15 - 0.4
 - FUNCTION to AM
 - AF GAIN to Maximum
 - SELECTIVITY to OFF
 - MVC-AVC to MVC
 - RF GAIN to 3/4 full position
 - Main and Bandsread tuning pointers to extreme right of dial
3. Connect the generator between pin 7 of V4 socket (6BE6 Mixer tube) and chassis.
4. Set generator at 455 Kc, modulated with 400 or 1000 cycles (30%).
5. For location of adjustment points, refer to Figures A and B. When carrying out alignment, keep generator output as low as possible at all times, and lower progressively as circuits come into line.
6. Adjust the secondary and primary of IF transformers T3, T2 and T1. Follow the order given, secondary first, then primary in each case. Repeat until no further improvement is noted.

BFO ALIGNMENT

7. All receiver controls should be set as for the IF alignment, with the exception of the following:
 - FUNCTION to SSB-CW
 - BFO to mid-position (dot)
8. Set the generator to 455 Kc, unmodulated RF.
9. Adjust the BFO coil T5 (see Fig. A) to produce a "zero beat" in the output.
10. Return Function switch to AM.

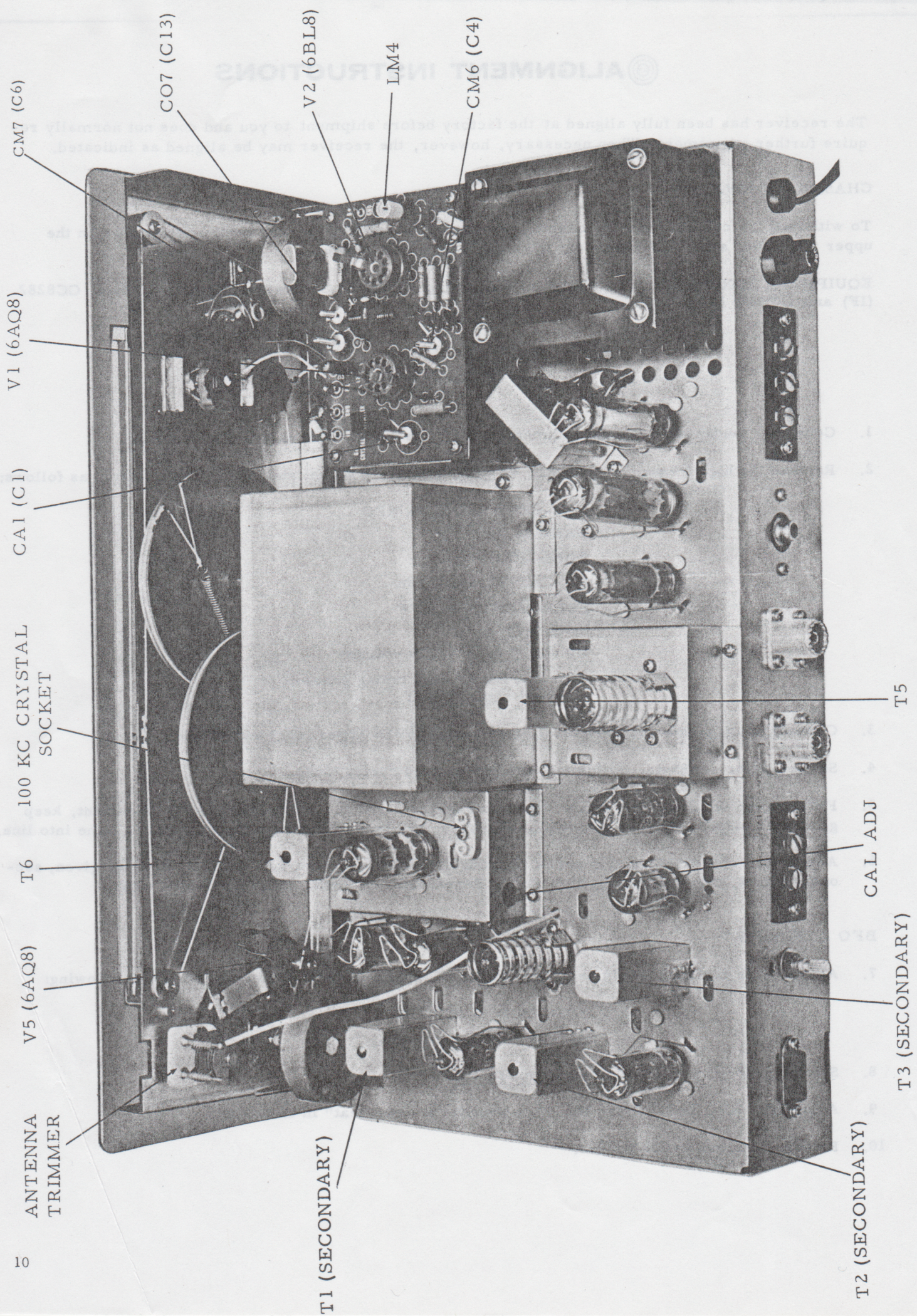


FIGURE A — TOPSIDE ADJUSTMENTS

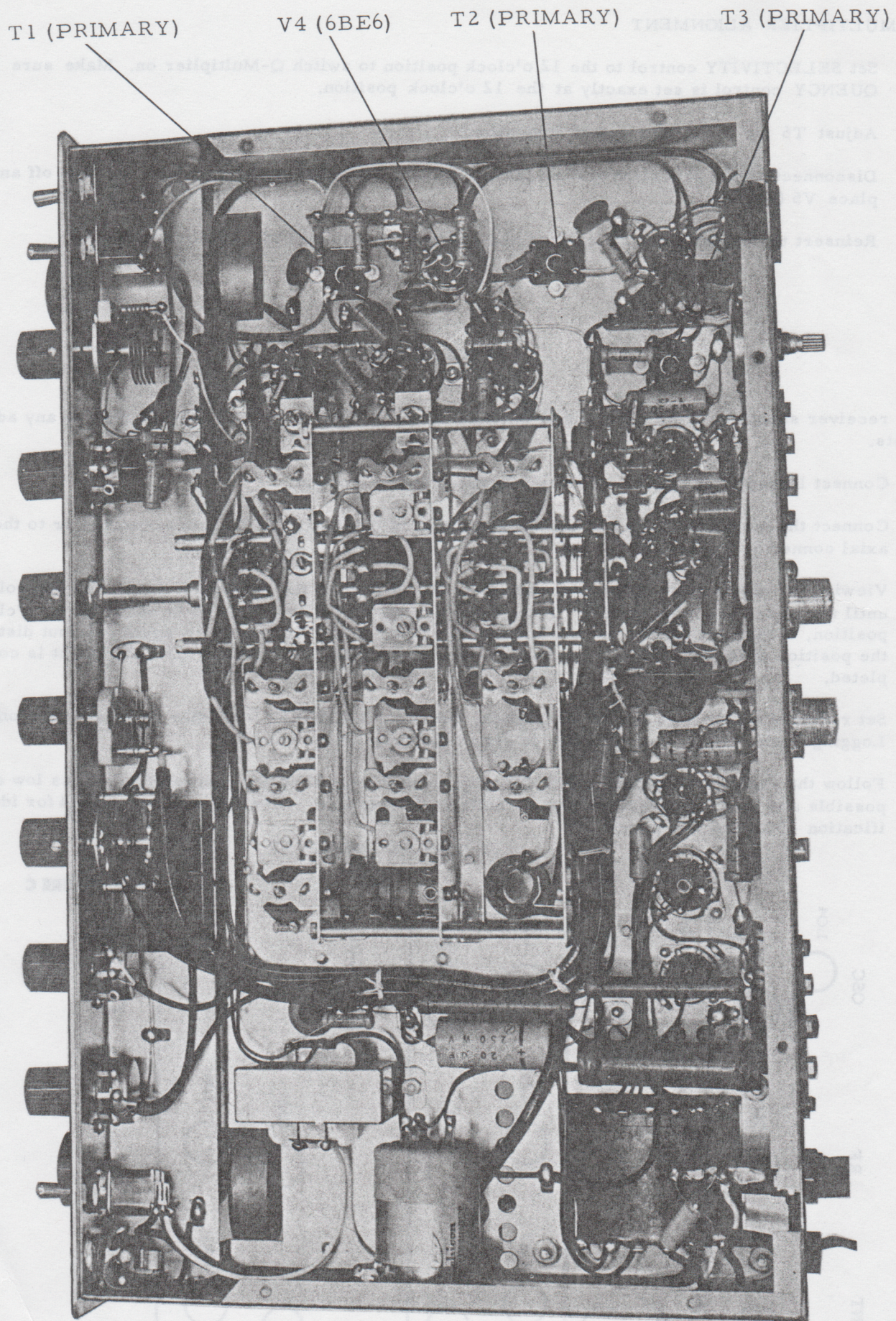


FIGURE B — UNDERSIDE ADJUSTMENTS

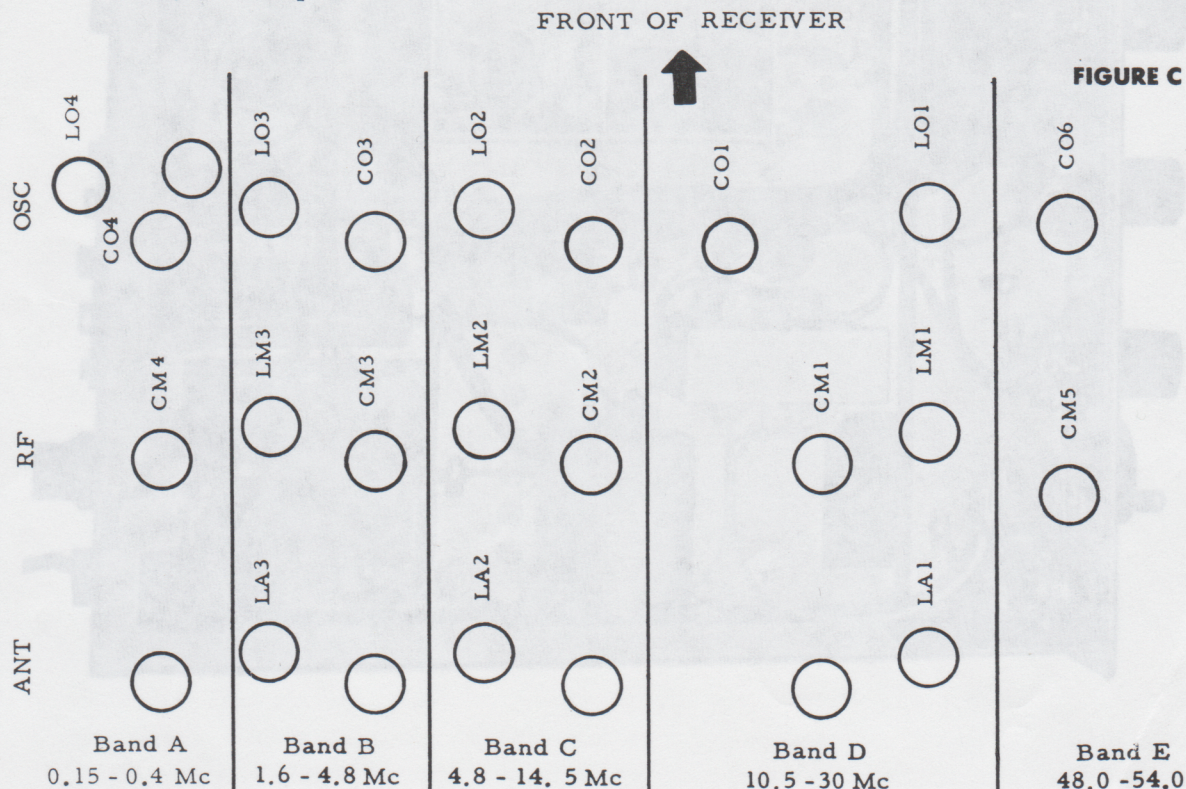
Q-MULTIPLIER ALIGNMENT

11. Set SELECTIVITY control to the 12 o'clock position to switch Q-Multiplier on. Make sure FREQUENCY control is set exactly at the 12 o'clock position.
12. Adjust T6 for maximum output indication.
13. Disconnect Signal generator and all test equipment connected to the receiver. Switch off and replace V5 (6AQ8).
14. Reinsert the chassis into the cabinet and proceed as indicated for RF alignment.

RF ALIGNMENT

The receiver should be in its cabinet and warmed up for at least 15 minutes before making any adjustments.

1. Connect loudspeaker and AC voltmeter across receiver output.
2. Connect the modulated output of the RF generator to the MAIN ANT input terminals or to the coaxial connector marked MAIN ANT.
3. Viewing the plates of the antenna trimmer (from the rear of the receiver), rotate the control knob until the plates are half-meshed. If the indicator dot on the control knob is not at the 12 o'clock position, loosen set screw, set the knob to this position and tighten screw again (without disturbing the position of the plates). Do not change the control from this position until alignment is completed.
4. Set receiver controls as for IF Alignment, but set BANDSPREAD pointer exactly on 100 on the Logging Scale. Main tuning pointer is set as indicated in the chart.
5. Follow the procedure outlined in the RF alignment chart. Keep RF generator output as low as possible and lower progressively as circuits come into line. Use Figure C on page 14 for identification of adjustment points.



RF ALIGNMENT CHART

STEP	BAND SWITCH	SIGNAL GENERATOR	MAIN TUNING	ADJUST	REMARKS	VIEW
1	0.15 - 0.4	0.16 Mc (150 Kc)	0.16 Mc	LO4 (Osc)*	Adjust for peak reading on voltmeter	Figure C
2	0.15 - 0.4	0.35 Mc (350 Kc)	0.35 Mc	CO4 (Osc)		

Repeat steps 1 & 2 until calibration is correct at both ends of scale (.6 and 1.4 Mc)

3	0.15 - 0.4	0.35 Mc (350 Kc)	0.35 Mc	CM4 (RF)	Adjust for peak reading on voltmeter	Figure C
4	1.6 - 4.8	2.0 Mc	2.0 Mc	LO3 (Osc)		
5	1.6 - 4.8	4.0 Mc	4.0 Mc	CO3 (Osc)		

Repeat steps 4 & 5 until calibration is correct at both ends of the scale (2.0 and 4.0 Mc)

6	1.6 - 4.8	2.0 Mc	2.0 Mc	LM3 (RF)	Adjust for peak reading on voltmeter	Figure C
7	1.6 - 4.8	4.0 Mc	4.0 Mc	CM3 (RF)		

Repeat steps 6 & 7 until calibration is correct at both ends of the scale (2.0 and 4.0 Mc)

8	1.6 - 4.8	2.0 Mc	2.0 Mc	LA3 (Ant)	Adjust for peak reading on voltmeter	Figure C
9	4.8 - 14.5	5.0 Mc	5.0 Mc	LO2 (Osc)		
10	4.8 - 14.5	14.0 Mc	14.0 Mc	CO2 (Osc)		

Repeat steps 9 & 10 until calibration is correct at both ends of the scale (5.0 and 14.0 Mc)

11	4.8 - 14.5	5.0 Mc	5.0 Mc	LM2 (RF)	Adjust for peak reading on voltmeter	Figure C
12	4.8 - 14.5	14.0 Mc	14.0 Mc	CM2 (RF)		

Repeat steps 11 & 12 until calibration is correct at both ends of the scale (5.0 and 14.0 Mc)

13	4.8 - 14.5	5.0 Mc	5.0 Mc	LA2 (Ant)	Adjust for peak reading on voltmeter	Figure C
14	10.5 - 30	12.0 Mc	12.0 Mc	LO1 (Osc)		
15	10.5 - 30	26.0 Mc	26.0 Mc	CO1 (Osc)		

Repeat steps 14 & 15 until calibration is correct at both ends of scale (12.0 and 26.0 Mc)

16	10.5 - 30	12.0 Mc	12.0 Mc	LM1 (RF)	Adjust for peak reading on voltmeter	Figure C
17	10.5 - 30	26.0 Mc	26.0 Mc	CM1 (RF)		

Repeat steps 16 & 17 until calibration is correct at both ends of scale (12.0 and 26.0 Mc)

18	10.5 - 30	12.0 Mc	12.0 Mc	LA1 (Ant)	Adjust for peak reading on voltmeter	Figure C
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*NOTE: On all bands, the oscillator is set on the high frequency side of the incoming signal.

6 METER PRE-CONVERTER ALIGNMENT

For the two following adjustments, leave the RF generator connected to the Main antenna input, but increase its output level considerably.

STEP	BAND SWITCH	SIGNAL GENERATOR	MAIN TUNING	ADJUST	REMARKS	VIEW
19	48-54	11 Mc	54 Mc	CO6	Adjust for peak reading on voltmeter	Figure C
20	48-5	11 Mc	54 Mc	CM6	Adjust for peak reading on voltmeter	Figure C

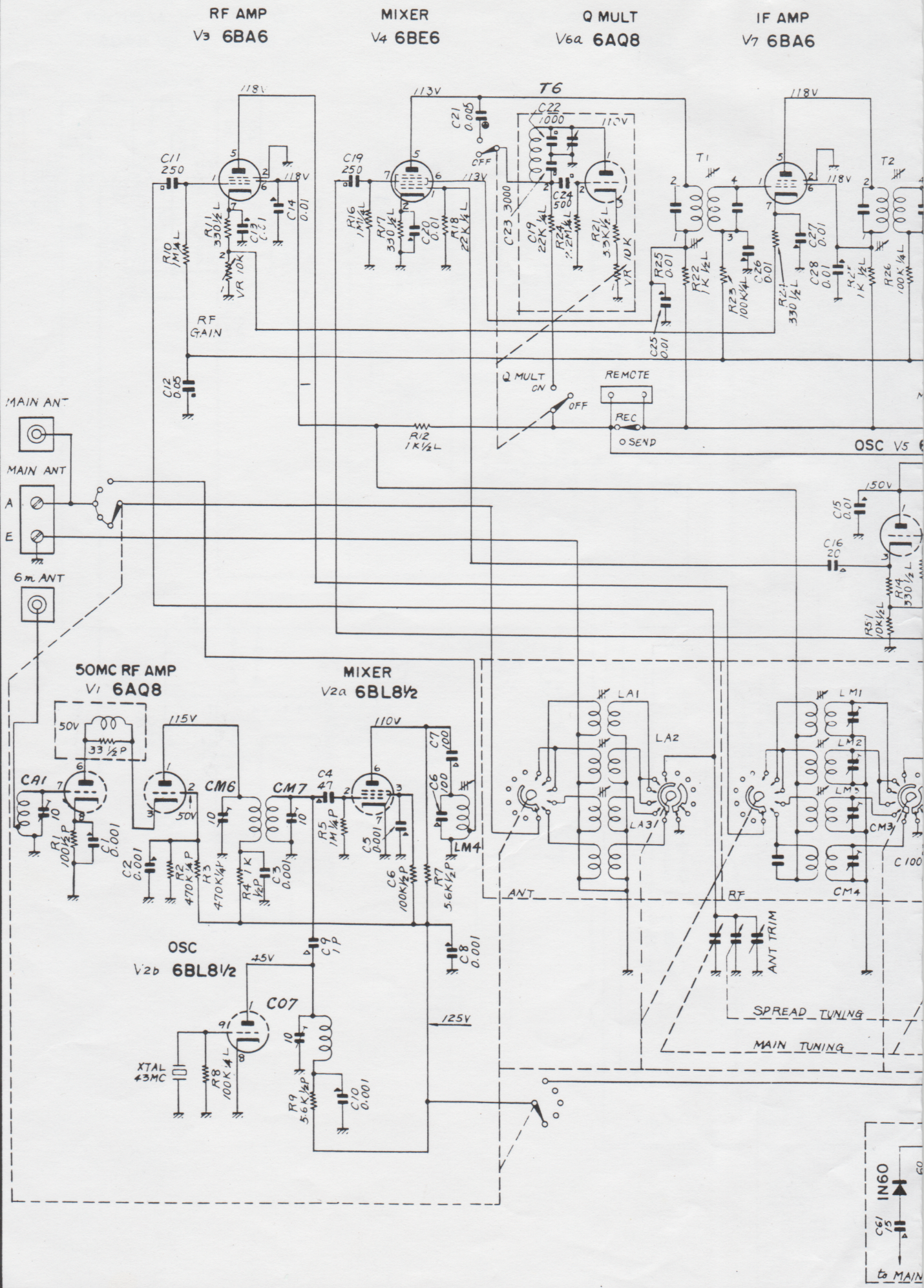
21. Disconnect all test equipment, switch receiver off and withdraw the chassis from the cabinet.
22. Switch receiver on again and reconnect test equipment, with the Signal generator connected across a 75 ohm resistor to the "6M ANT" connector. To prevent possible frequency shift (due to the uncovering of trimmers and coils on the underside), it is recommended that the receiver be placed on a steel metal plate so that the underside is shielded.
23. Allow at least 10 minutes warm-up time before making the next adjustments.
24. Set generator to 25.5 Mc and tune the receiver to 51 Mc (to receive the second harmonic).
25. Viewing Figure A, adjust the following for maximum output indication:

LM4, CO7, CM7, CM6, CA1

Use the sequence shown. Lower Signal generator output progressively to prevent overloading.

NOTE: For purposes of clarity, Figure A shows the tubes in the pre-converter section removed. During alignment these tubes are not removed, of course.

This completes the IF and RF alignment of the receiver. Disconnect AC voltmeter and RF generator and attach an antenna to the Main Antenna input.



/8 6BA6

V10 6BE6

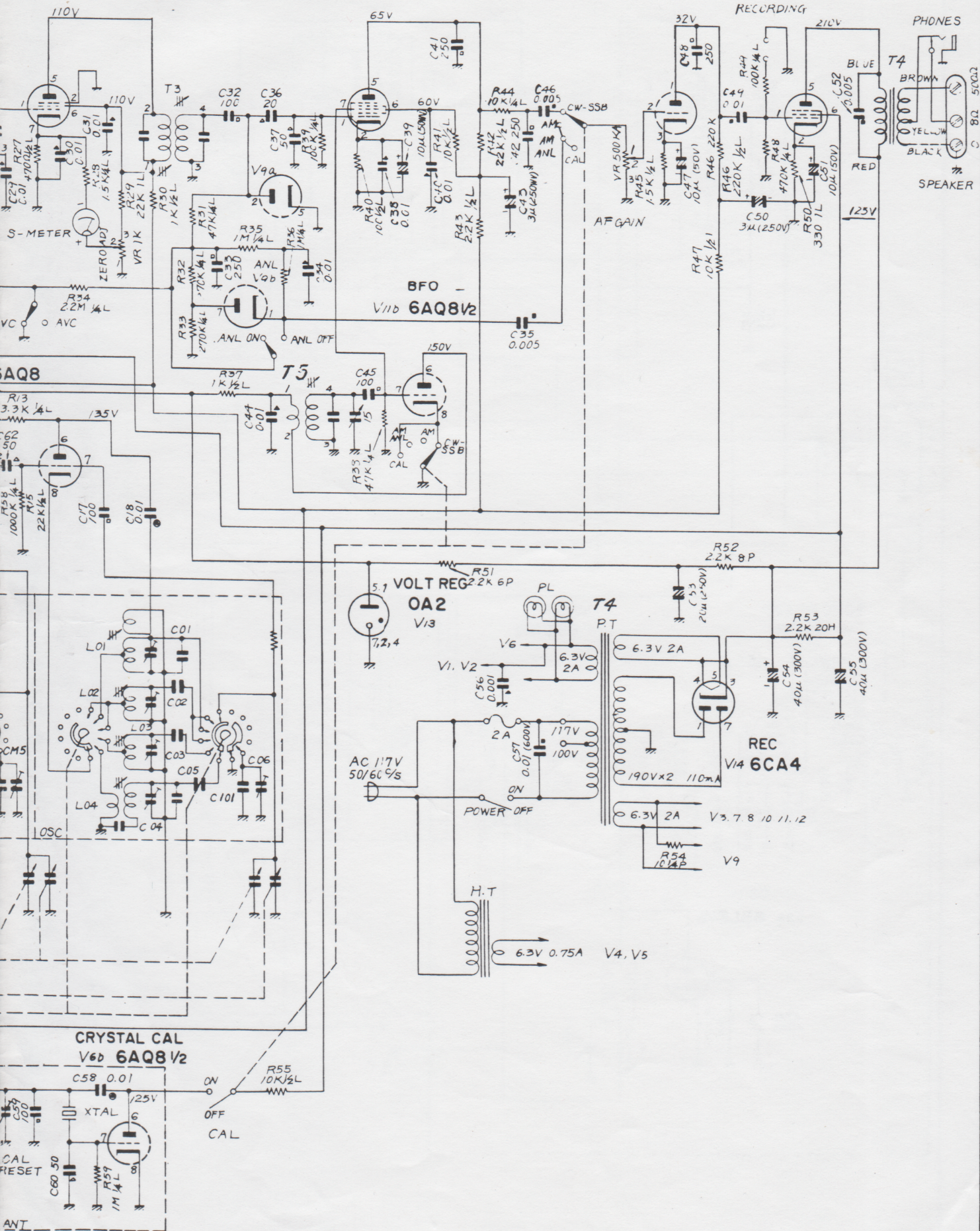
Vila 6A08

V12 6AQ5

V9a AM DET

V9a AM DET

V90 ANL

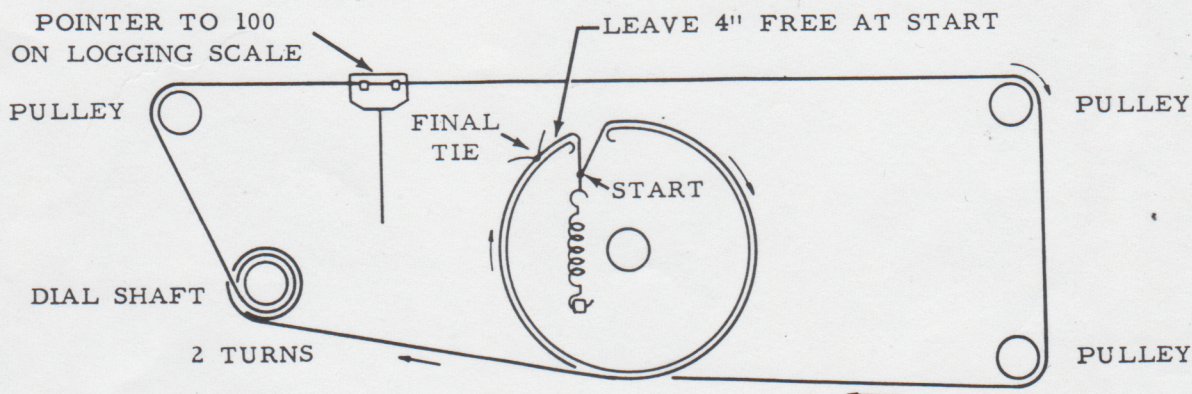


CALIBRATING THE 100 KC OSCILLATOR

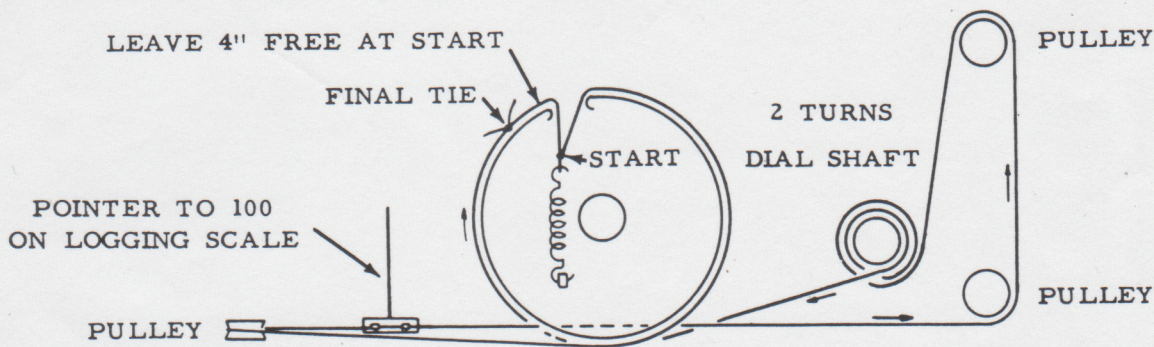
Set all controls on the receiver for normal AM reception and make sure the 100 Kc crystal is inserted into its socket on the receiver (see Fig. A). Tune in Standard Frequency Stations WWV on 2.5, 5, 10, 15, 20, 25 Mc, or WWVH on 5, 10 or 15 Mc, whichever provides a good signal at your location. Wait for the period when the modulation is absent, then set FUNCTION switch to CAL. Using a non-metallic screwdriver, slowly adjust the CAL ADJ trimmer within the receiver (see Fig. A) until the calibrator harmonic is in zero beat with WWV/WWVH. Adjust in the direction which causes the heterodyne tone to drop in pitch. As the zero beat is approached, a slow flutter will be heard which will disappear or occur at a very slow rate when the two frequencies coincide. Do not attempt this calibration during the periods when the WWV/WWVH signal is tone modulated -- you may inadvertently adjust the harmonic signal to zero beat with a sideband instead of the carrier.

DIAL CORD STRINGING

Set main or bandspread tuning capacitor as indicated. In both cases, tie dial cord to spring at the START point, leaving approximately 4 inches of cord free at this point. Restring in the direction indicated, keeping a moderate amount of tension on the cord. Make final tie to free end of cord from spring after cutting off any excess cord.



MAIN TUNING PULLEY FULLY COUNTER-CLOCKWISE.
CAPACITOR PLATES FULLY OPEN

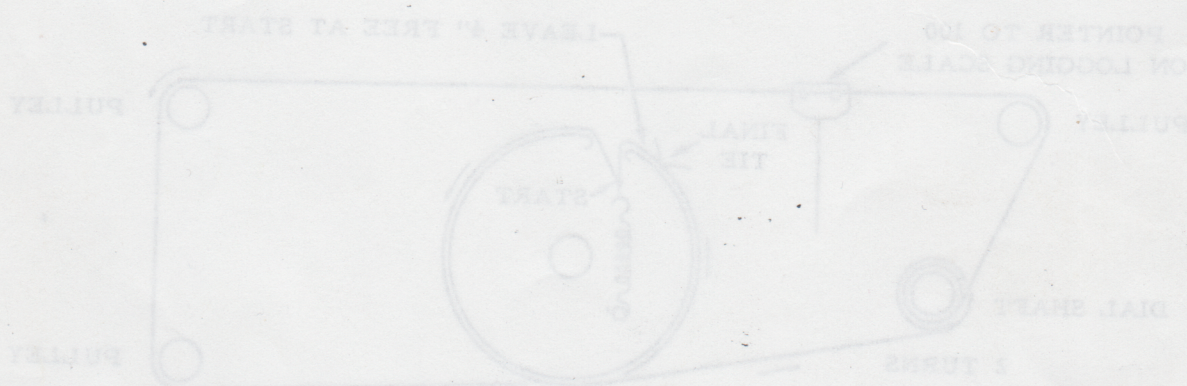


BANDSPREAD PULLEY FULLY COUNTER-CLOCKWISE.
CAPACITOR PLATES FULLY OPEN

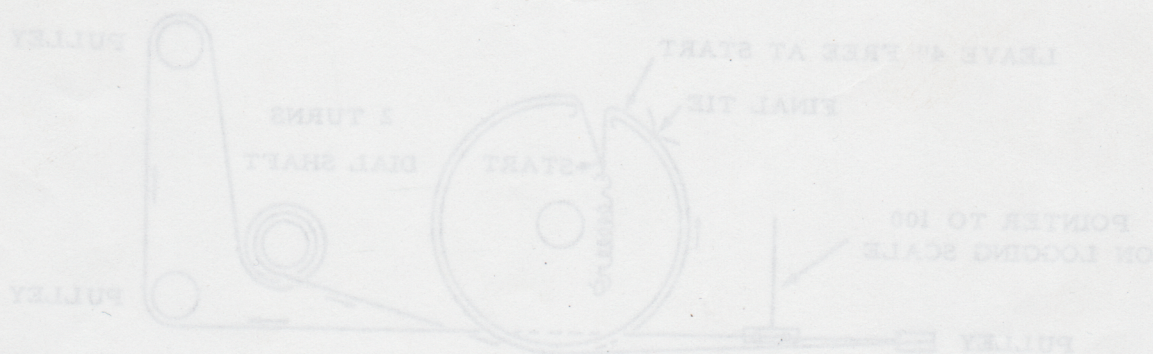
Get all controls on the receiver for normal AM reception and make sure the 100 Kc crystal is inserted into the socket on the receiver (see Fig. A). Tune in Standard Frequency Station WWV on 2, 5, 10, 15, 20, 25 Mc. or WWVH on 5, 10 or 15 Mc. whichever provides a good signal at your location. Wait for the period when the modulation is absent, then set FUNCTION switch to CAL. Using a non-metallic screwdriver, slowly adjust the CAL ADJ. trimmer within the receiver (see Fig. A) until the heterodyne or beat note is at zero beat with WWV/WWVH. Adjust in the direction which causes the heterodyne to drop in pitch. As the zero beat is approached, a slow flutter will be heard which will disappear or occur at a very slow rate when the two frequencies coincide. Do not attempt this calibration during the periods when the WWV/WWVH signal is tone modulated -- you may inadvertently adjust the heterodyne signal to zero beat with a sideband instead of the carrier.

DIAL CORD STRETCHING

Set main or bandspread tuning capacitor as indicated. In both cases, the dial cord is spring at the START point, having approximately 4 inches of cord free at the point. Resting in the direction indicated, keeping a moderate amount of tension on the cord. Make final tie to free end of cord from spring after cutting off any excess cord.



MAIN TUNING PULLEY FULLY COUNTER-CLOCKWISE
CAPACITOR PLATES FULLY OPEN



BANDSPREAD PULLEY FULLY COUNTER-CLOCKWISE
CAPACITOR PLATES FULLY OPEN

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